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# Three Species Masquerading as One: Updating the Taxonomy of *Pseudomethoca russeola* Mickel and *P. donaeanae* (Cockerell & Fox) (Hymenoptera: Mutillidae)

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*Abstract.*—*Pseudomethoca donaeanae* (Cockerell & Fox) was described based on females only, while *P. russeola* Mickel was described based on males only. Manley (1999) synonymized *P. russeola* with *P. donaeanae* after associating a male that superficially resembles *P. russeola* with *P. donaeanae*. Close examination of male genitalia of specimens currently identified as *P. donaeanae*, along with additional morphological characters, suggests that three species are actually being misidentified as a single species. Our comparison of the male associated with *P. donaeanae* with the type specimen of *P. russeola* (male) suggests that these species are not synonymous. The male of *P. donaeanae* is described for the first time, and *P. russeola* **new comb.**, is resurrected from synonymy and redescribed. The third species, *P. ajattara* **sp. nov.** also superficially resembles *P. russeola* and *P. donaeanae*, but has definitive genitalia with hooked setae located ventrally along the internal margin of the parameres. The females of neither *P. russeola* or the undescribed species are known.

*Pseudomethoca* Ashmead is one of the largest diurnal mutillid genera in the New World, including almost 50 species in the United States. *Pseudomethoca* species occur throughout the Americas, from Canada to Argentina (Nonveiller 1990). This range is slightly misleading, however, because *Pseudomethoca* appears to be an unnatural grouping (pers. obs). Like other mutillid genera, *Pseudomethoca* species exhibit extreme sexual dimorphism. As a result, less than half of the species are known from both sexes (Krombein 1979). Additional problems stem from the relative lack of obvious characters useful for diagnosing species based on males. While many females have unique coloration schemes, males exhibit a limited suite of coloration, with most species having the integument entirely black and the setae mostly silver. In some cases, males with unique coloration are immediately recognizable, and additional morphological characters are ignored.

*Pseudomethoca russeola* Mickel (1924), known only from the male, is among the species having unique coloration. The head and mesosoma are black, while the metasoma is orange, and the entire insect is clothed with silvery setae. The male of *P. donaeanae* (Cockerell & Fox) was discovered by Manley (1999), when he attracted two males to a caged female. He identified these males as *P. russeola* and synonymized the two species under the name *P. donaeanae* presumably based on this "unique" coloration. A study of male genitalia and other characters in *Pseudomethoca* led to the discovery of three unique species that currently are identified as *P. russeola*, with all possessing the unique coloration. The taxonomy and sex associations of these species are addressed in this paper.

## MATERIALS AND TERMINOLOGY

The following acronyms are used for institutions housing the material discussed in the current study:

ANSP Department of Entomology, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA.

ASUT Frank M. Hasbrouck Insect Collection, Department of Zoology, Arizona State University, Tempe, Arizona, USA.

CASC Department of Entomology, California Academy of Sciences, San Francisco, California, USA.

CISC Essig Museum of Entomology, Department of Entomological Sciences, University of California, Berkeley, California, USA.

CSUC C.P. Gillette Arthropod Biodiversity Museum, Department of Entomology, Colorado State University, Fort Collins, Colorado, USA.

DGM Personal Collection of Donald G. Manley, Pee Dee Research Center, Florence South Carolina, USA.

EMUS Department of Biology Insect Collection, Utah State University, Logan, Utah, USA.

TAMU Department of Entomology Insect Collection, Texas A&M University, College Station, Texas, USA.

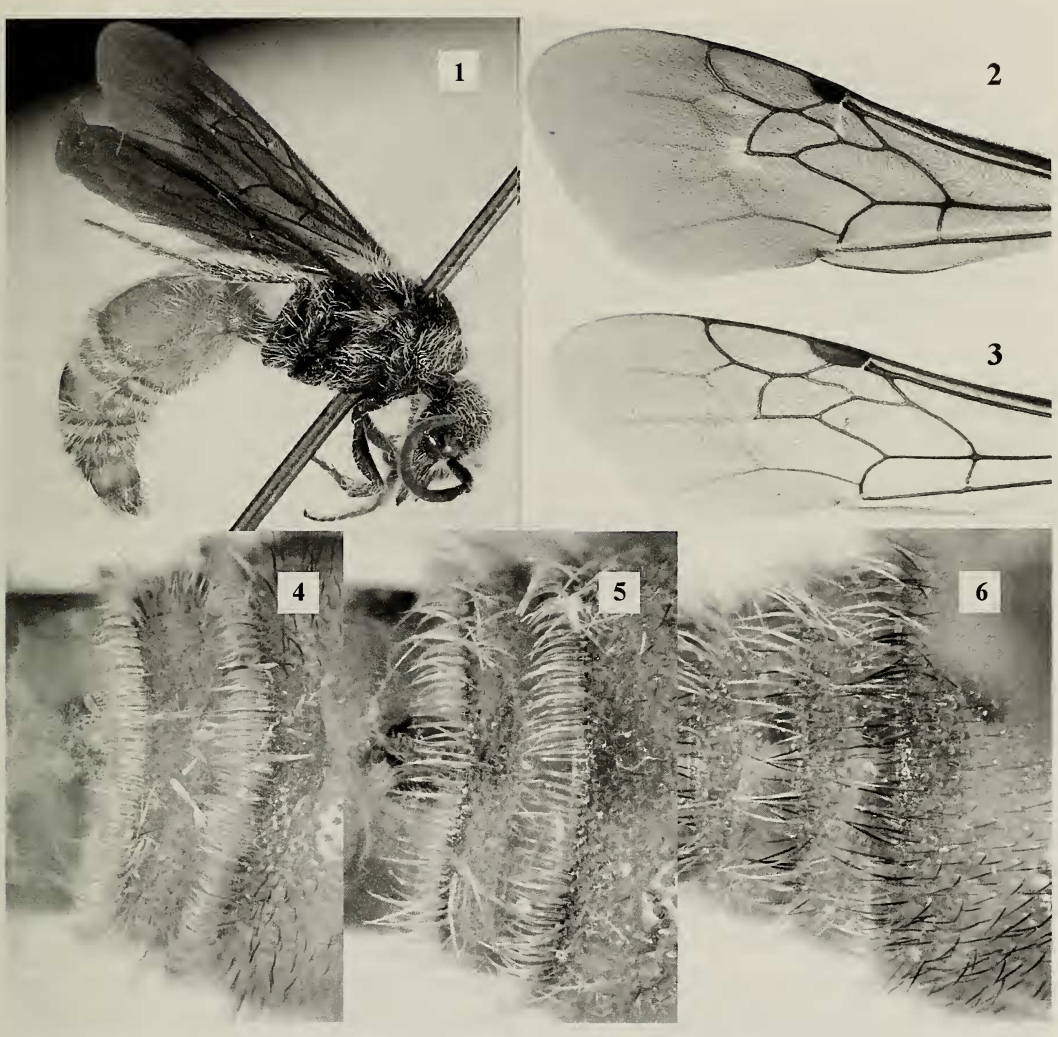
NMNH Department of Entomology, Smithsonian Institution, National Museum of Natural History, Washington, District of Colombia, USA.

The holotype of *P. russeola* was examined, but that of *P. donaeanae* was not available. We have used the acronyms T2, T3, etc., to denote the second, third, etc., metasomal tergites while S2, S3, etc., denote the second, third, etc., metasomal sternites. Lastly, punctures can sometimes be elongate and their posterior edge indistinct. We have used the term "puncture width" to indicate the transverse measurement of the width of a puncture. This is the only way to accurately and reproducibly measure an elongate puncture.

### *Pseudomethoca ajattara*, new species
(Figs 1, 2, 5, 7, 10–13)

*Diagnosis.*—The male is similar to *P. donaeanae* and *P. russeola* in coloration, wherein the integument of the head and mesosoma is black, the integument of the metasoma is orange, and the setae are silvery white (Fig. 1). This species can be separated from other species with this coloration by the following combination of characters: the head is narrower than pronotum; the clypeus is expanded anteriorly with two medial approximate teeth (Fig. 7); the apical fringes of T2-4 have dense, thick, pale golden setae, while T4-5 have interspersed brown and pale golden setae; the paramere has long, elbowed setae along the internal margin (Fig. 10); and the cuspis has an apical finger-like process (Fig. 10).

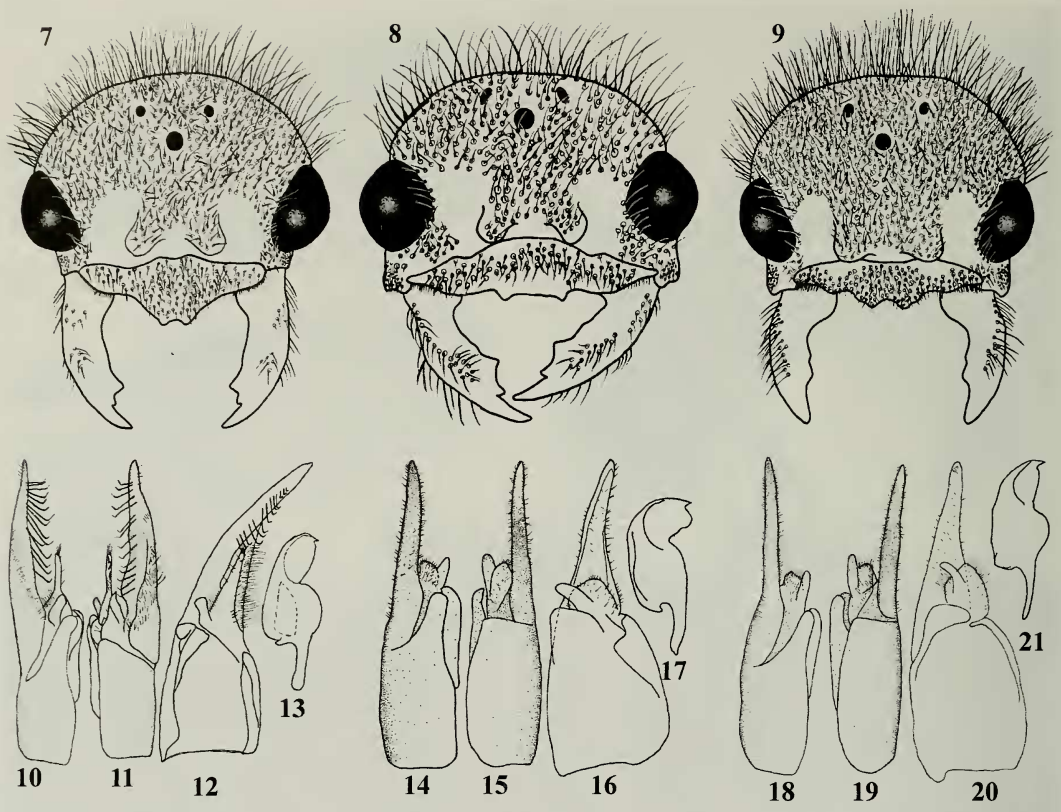
*Male holotype description.—Coloration*: Head and mesosoma black to dark reddish-brown, except metapleuron red; metasoma orange; legs dark reddish-brown; tibial spurs reddish-brown, lighter than legs. Wings slightly infuscated. Setae of head, mesosoma, and legs silvery white, except mesonotum with erect and appressed dark brown setae. Setae of metasoma entirely pale golden, except T5-6 and disc of T2 having interspersed brown and pale golden setae. *Head*: Narrower than pronotum, densely punctate throughout. Mandible oblique, tridentate apically, inner tooth strongly developed (Fig. 7). Clypeus densely punctate, anteriorly expanded, covering inner margin of mandibles, with two approximate median teeth (Fig. 7). Antennal scrobe lacking carina. Ocelli miniscule; ocellocular distance 10× length of lateral ocellus, interocellar distance 3× lateral ocellar length. Flagellomere I 2× pedicel length; flagellomere II 3× pedicel length. *Mesosoma*: Pronotum moderately punctate; mesonotum and scutellum densely punctate; mesopleuron moderately




Figs 1–6: Habitus, Fig. 1: *Pseudomethoca ajattara*. Metasomal terga, Figs. 2–4; Fig. 2: *P. ajattara*; Fig. 3: *P. donaeanae*; Fig. 4: *P. russeola*. Fore wing, Figs. 5–6: Fig. 5: *P. ajattara*; Fig. 6: *P. donaeanae*.

punctate with micropunctures anteriorly, metapleuron glabrous; propodeum reticulate dorsally, horizontally striate laterally. Tegula evenly convex, punctate and pubescent throughout. Marginal cell 2.75× length of stigma. *Metasoma*: Petiole broadly sessile, evenly convex. Apical fringes of T2-4 forming dense rows of short, evenly spaced, slightly curved, pale golden bristles; bristles separated by 0.5× bristle width. T1 with ovate punctures; T2 and S2 moderately punctate; T3-6 and S3-6 moderately punctate. S1 with low longitudinal carina. Pygidium densely punctate, with micropunctures and fine setae among punctations. Hypopygidium densely punctate, apical margin nearly flat. *Genitalia* (Figs 10–13): Paramere tapering apically, curved ventrally and slightly curved laterally at apex, with dense ventral brush and long curved bristles along inner margin. Cuspis with apical, finger-like process, 0.4× free length of paramere, setose basally, with apical tuft and short, thick bristles on venter of finger-like process. Basal lobe of cuspis short, glabrous. Penis valve unidentate apically, hooked baso-dorsally.

*Length*.—10 mm.




Figs 7–21: Clypeus, Figs. 7–10; Fig. 7: *Pseudomethoca ajattara*; Fig. 8: *P. donaeanae*; Fig. 9: *P. russeola*. Male genitalia: dorsal view, ventral view, lateral view, and penial valve, Figs 10–21: Figs 10–13: *P. ajattara*; Figs 14–17; *P. donaeanae*; Figs 18–21: *P. russeola*.

*Female.*—Unknown.

*Host.*—Unknown.

*Etymology.*—From Finnish mythology, Ajattara is an evil forest spirit. Treat as noun in apposition.

*Distribution.*—USA: southeastern Arizona.

*Holotype.*—USA: ARIZONA: *Cochise Co.*, Portal, 8.IX.1974, H. & M. Townes coll. (EMUS).

*Remarks.*—This new species is closely related to *P. nigricula* Mickel based on the genitalia, which are virtually identical (Figs 10–13; Fig. 6 in Mickel 1924). These species can be separated by setal and integumental coloration; *P. nigricula* has the integument and setae entirely black, while *P. ajattara* **sp. nov.** has the metasomal integument orange and most of the setae pale golden (Fig. 1). Additionally, *P. nigricula* has coarser punctation, especially on the pronotum and genae, where the punctures are deep and contiguous. The curved setae on the internal margin of the paramere of these two species are unique among United States species. In Mexico, however, at least three undescribed species have been examined with this genitalic feature (*pers. obs.*), which will be described at a later date.

### *Pseudomethoca donaeanae* (Cockerell and Fox)

(Figs 3, 6, 8, 14–17)

*Sphaeropthalma dona-anae* Cockerell and Fox, 1897: 136. HOLOTYPE ♀, USA, New Mexico (ANSP).

*Mutilla donae-anae* Fox, 1899: 224. ♀

*Pseudomethoca Donae-Anae* André, 1903: 28. ♀

*Pseudomethoca donaeanae* Krombein, 1979: 1302. ♀

*Pseudomethoca donaeanae* Manley, 1999: 32. ♀ ♂

*Female diagnosis.*—This species can immediately be separated from all other known females of North American *Pseudomethoca* by the presence of a prominent rugose tubercle on the dorsum of the propodeum medially, although the females of *P. ajattara* and *P. russeola* are unknown.

*Male diagnosis.*—The male is similar to *P. russeola* and *P. ajattara* **sp. nov.** in coloration, wherein the integument of the head and mesosoma is black, the integument of the metasoma is orange, and the setae are silvery white. This species can be separated from these species by the following combination of characters: head broader than pronotum; clypeus with small, widely separated lateral teeth (Fig. 8); fringes of T2-4 with thick, slightly curved, pale silver setae and T5 with simple intermixed black and silver setae (Fig. 3); paramere covered with simple setae only (Fig. 14); and cuspis rectangular (Fig. 14).

*Male description.—Coloration*: Head and mesosoma black or dark reddish-brown; metasoma orange; legs reddish-brown, lighter than head and mesosoma; tibial spurs white; wings slightly infuscated. Setae of head, mesosoma, and legs silvery white, except mesonotum having appressed black setae interspersed with erect white setae. Setae of metasoma entirely silvery white, except T6-7 and disc of T2 having some black setae. *Head*: Broader than pronotum. Front and gena densely punctate, vertex moderately punctate. Mandible oblique, tridentate apically, inner tooth strongly developed (Fig. 8). Clypeus weakly punctate, flat anteriorly, with two small, sharp, lateral teeth (Fig. 8). Antennal scrobe lacking carina. Ocelli minuscule; ocellocular distance 10× length of lateral ocellus, interocellar distance 3× lateral ocellar length. Flagellomere I 1.5× pedicel length; flagellomere II 2.5× pedicel length. *Mesosoma*: Pronotum and scutellum densely punctate; mesonotum and mesopleuron moderately punctate; metapleuron glabrous; propodeum reticulate dorsally, anterior margin glabrous laterally. Tegula evenly convex, pubescent anteriorly, glabrous posteriorly. Marginal cell 1.75× length of stigma (Fig. 6). *Metasoma*: Petiole broadly sessile, evenly convex. Apical fringes of T2-5 and S2-4 forming rows of short, evenly spaced, slightly curved, silvery white bristles, those of T2-5 separated by the bristle width, those of S2-4 separated by 2× the bristle width (Fig. 3). T1 with elongate shallow punctures; T2 and S2 moderately punctate; T3-6 and S3-6 densely punctate. S1 with low longitudinal carina. Pygidium densely punctate, with micropunctures and fine setae among punctations. Hypopygidium densely punctate, apical margin slightly convex. *Genitalia* (Figs 14–17): Paramere tapering apically, moderately setose throughout, weakly curved ventrally. Cuspis short, 0.25× free length of paramere, rectangular, setose throughout. Basal lobe of cuspis extending beyond anterior margin of cuspis, dorsally curved, glabrous. Penis valve unidentate with ventral lobe apically, hooked basodorsally.

*Length.*—8–9 mm.

*Host.*—Unknown.

*Distribution.*—USA: southern Arizona and New Mexico, southeastern California; MEXICO: northeastern Baja California.

*Material examined.*—USA: **ARIZONA**: *Cochise Co.*, Portal, 1♂, 2.IX.1959, H.E. Evans coll. (DGM); *Maricopa Co.*, Granite Reef Dam, 1♂, 4.X.1964, J.W. Debolt (ASUT); *Pinal Co.*, Sacaton, 1♂, Geo. Harrison coll. (NMNH); **CALIFORNIA**: *Imperial Co.*, El Centro, 1♂ 1♀, 7.VII.1955, A. Ross coll. (EMUS); **NEW MEXICO**: *Dona Ana Co.*: Hatch, 2♂, 28–29.VII.1974, H. & M. Townes coll. (EMUS); 2 km E Radium Springs, 1♂, 2.X.1992, D.G. Manley coll. (DGM); *Hidalgo Co.*: Rodeo, 1♂, 28.VIII.1959, H.E. Evans coll. (DGM). MEXICO: **BAJA CALIFORNIA**: Mexicali, 1♂, 16.VI.1956 (CSUC); **SONORA**: 2.6 mi W La Jollita, 1♂, 21.IX.1967, G. I. Marsh coll. (CISC).

*Remarks.*—The sex association was discovered by Manley (1999), when he attracted two males to a caged female specimen in New Mexico. He identified the males as *P. russeola* Mickel, and synonymized the two species. Although this male keys out to

*P. russeola* using Mickel (1924, 1935), it has numerous morphological differences from the type of that species. Most notably, the head is broader than the pronotum (narrower in *P. russeola*), the clypeus is glabrous anteromedially (Fig. 8) (punctate throughout in *P. russeola*) (Fig. 9), and metasomal terga two to four have rows of short silver bristles (Fig. 3) (the terga of *P. russeola* have simple setae only) (Fig. 4).

Manley (1999) also suggests that the record of *P. donaeanae* from Calexico, CA may be based on a mislabelled specimen, and that it was unlikely that *P. donaeanae* actually lives that far west. A male and female from El Centro, CA and a male from Mexicali, Baja California have been examined, however, and both of these sites are within 15 miles of Calexico. Thus, we believe that the Calexico locality is legitimate. This is a relatively uncommon distribution, but many species of *Dasymutilla* Ashmead that are typically recognized from Arizona and New Mexico, have also been found in the western Sonoran Desert in California (Hurd, 1951).

### *Pseudomethoca russeola* Mickel
(Figs 4, 9, 18–21)

*Pseudomethoca russeola* Mickel, 1924: 44. **NEW COMBINATION. HOLOTYPE** ♂, USA, Texas, San Diego, 4 May 1901, R.A. Cushman coll. (NMNH).

*Diagnosis.*—The male of this species is similar to *P. donaeanae* and *P. ajattara* **sp. nov.** in coloration, wherein the integument of the head and mesosoma is black, the integument of the metasoma is orange, and the setae are silvery white. This species can be separated from these species by the following combination of characters: head narrower than pronotum; clypeus with moderate, separated lateral teeth (Fig. 9); T2-5 with intermixed sparse, simple, black and silver setae (Fig. 4); paramere covered with simple setae only (Fig. 18); and cuspis rectangular (Fig. 18).

*Additions to male description.*—Antennal scrobe lacking carina. Ocelli minuscule; ocellocular distance 10× length of lateral ocellus, interocellar distance 3× lateral ocellar length. Flagellomere I 1.5× pedicel length; flagellomere II 2.5× pedicel length. Marginal cell of forewing 1.5× length of stigma. First metasomal sternum with low longitudinal carina. Pygidium densely punctate, with micropunctures and fine setae among punctations. Hypopygidium densely punctate, apical margin slightly convex. *Genitalia* (Figs 18–21): Paramere tapering apically, moderately setose throughout, weakly curved ventrally. Cuspis short, 0.25× free length of paramere, rectangular, setose throughout. Basal lobe of cuspis extending beyond anterior margin of cuspis, dorsally curved, glabrous. Penis valve unidentate apically, angulate basodorsally.

*Length.*—8–10 mm.

*Female.*—Unknown.

*Host.*—Unknown.

*Distribution.*—USA: southern Texas.

*Material examined.*—USA: TEXAS: *Bexar Co.*: Leon Creek, 1♂, 19.X.1952, M. Wasbauer coll.; *Hidalgo Co.*: Bentsen Rio Grande State Park, 1♂, 27.IV.1986, W.J. Pulawski coll. (CASC); 5♂, 27.V.1979, H. Evans, A. Hook & W. Rubick coll. (CSUC); 4♂, 15.V.1979, H. Evans, A. Hook & W. Rubick coll. (CSUC); 1♂, 13.VI.1978, C.C. Porter coll. (DGM); *Kleberg Co.*, Route 2045E, 30 mi. E Kingsville, 1♂, 3.XI.1990, T. Carlow coll. (TAMU).

*Remarks.*—This species seems to be restricted to the humid area of southern Texas, and is likely to extend far south into Mexico as well. We did not find any Mexican *P. russeola* specimens, most likely because few *Pseudomethoca* were available from that region. Unlike the other species examined in this paper, this species lacks thickened bristles on the metasomal terga, having only simple setae (Fig. 9).

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